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The 'shark recently discovered in Japanese waters,' described by Mr. Garman as *Chlamydoselachus anguineus* (in *Science* for Feb. 1, vol. iii. pp. 116, 117; *Bull. Essex inst.*, vol. xvi.), as its describer has remarked, "is a form of more than ordinary interest on account of the respects in which it differs from the majority of its kindred." It not only appears as a new element in selachology, and becomes the representative of a hitherto unknown type, but it throws light on the ancestry and some of the extinct forms of the class; and, still further, it may serve as a guide for the interpretation of certain of the tales of the sea-serpent.

In respect to its place in the system, I perfectly agree with Mr. Garman, that it is the representative of a very distinct family (*Chlamydoselachidae*): I am also of the opinion that it may be regarded as the type of a distinct sub-order at least. Mr. Garman, in *Science*, was "inclined to consider this the type of a new order, to which the name *Selachophichthioidi* might be given;" but in his article in the *Essex bulletin* he is entirely silent on the subject of the major relations of the new type. The name, having been thus never defined, and being objectionable on account of its length and cacophony, might be replaced by a shorter one, like *Pternodonta*; but on this I shall not insist. A more important question is, What is the status of the selachian in classification? Mr. Garman thinks that 'it stands nearer the true fishes than do the sharks proper.' I do not know how he would express this idea in a linear arrangement, but most would do so by placing it immediately between the selachians and fishes. I am also disposed to consider *Chlamydoselachus* to stand 'nearer the true fishes than do the sharks proper,' not because it appears to be in the line of descent between the two, but because it is nearer the primitive line from which both types have diverged. Judging from Mr. Garman's remarks in the two articles referred to, I presume there would be essential concordance between us as to this point.

As to the relations of *Chlamydoselachus* to extinct types, however, I must dissent from Mr. Garman. Fortunately, an article throwing light on the affinity of *Cladodus* has been published recently, — probably too recently to be available to Mr. Garman. I refer to Dr. R. H. Traquair's communication 'on a new fossil shark,' in the *Geological magazine* for January, 1884 (decade 3, vol. i. pp. 3-8, pl. 2). Dr. Traquair has therein made known the form of the cladodont selachians, and proved beyond doubt that the cladodont dentition and ctenacanthoid spines co-existed in the same fish. The 'new shark' in which these parts were coincident has been named *Ctenacanthus costelatus*. In the words of Dr. Traquair, "accepting the fish just described as a new species of *Ctenacanthus*, it yields us the following important facts regarding the genus:—

"1. The shape of the animal was moderately elongated, with blunt snout and heterocercal tail. 2. The skin was covered with shagreen granules, mostly of an ornate, ridged, pectinate character. 3. There were two dorsal fins, each with a spine, that of the first being the longer. There were no paired spines, and the ventral fin was opposite the second dorsal. The presence of an anal fin is doubtful. 4. The dentition was cladodont. 5. The vertebral axis was unsegmented, but there were extensive calcifications in connection with other parts of the skeleton."

It is obvious from this summary, that *Cladodus* was not at all related to *Chlamydoselachus*; and I may add, that it did not have the essential dentition of *Chlamydoselachus*, so well indicated by Mr. Garman

in the statement that "each tooth has three slender, curved, inward-directed cusps, and a broad base . . . preventing reversion."

But, as Professor Cope has claimed (*Science*, vol. iii. p. 275), *Chlamydoselachus* did have a representative in the carboniferous genus *Diplodus*, or *Didymodus*; although I do not think that the two can be congeneric. In fine, the recent discoveries by Messrs. Garman and Traquair enable us to co-ordinate a number of extinct types, and compel us, I think, to add two sub-orders or orders to the list of those necessary for the long-known living forms. The living sharks I have proposed (in Jordan and Gilbert's *Synopsis of the fishes of North America*, p. 967) to distribute among four sub-orders; of which the *Opistharthri* or *Notidanidae* are the most generalized, and the *Rhinae* or *Squatinidae* the most specialized. The two additional sub-orders appear to be still more generalized than the *Notidanidae*, and the sequence would therefore be as follows:—

1. *Lipospondyli*, including selachians without developed vertebrae, but with a persistent notochord, and comprising the family *Hybodontidae* (*Hybodus*, *Cladodus*, *Ctenacanthus*, etc.).
2. *Pternodonta* or *Selachophichthioidi*, including *Squali* with vertebral condition unknown, and with teeth having fixed bases, comprising the family *Chlamydoselachidae* (*Chlamydoselachus* and *Didymodus*).
3. *Opistharthri* or *Cyclospondyli*.
4. *Proarthri* (*Heterodontidae*).
5. *Anarthri* (most living sharks).
6. *Rhinae*.

It is by no means certain that the hybodontids are *Squali* at all, and they may prove to be more nearly related to the *Holocephali*. The plate of Dr. Traquair's memoir delineates very plainly one external branchial aperture, and one only; and the condition of the vertebral column and dorsal spines are features in which there is greater resemblance to the *Holocephali* than to the *Plagiostomes*. The primitive form from which the two diverged must theoretically have been not unlike the new *Ctenacanthus*, and it is quite possible that in the hybodonts we may have one of the 'missing links' between the two groups.

I had intended to refer to certain of the 'sea-serpents' which might be correlated with *Chlamydoselachus*; such as the Maine animal noted recently in the *Proc. U. S. nat. mus.*, the animal seen by Capt. Hope about 1848, and the selachian found in 1808, and partially described by Dr. Barclay, but must defer a notice to a future time.

THEO. GILL.

Evidence of unrecorded tornadoes.

There is evidence in the forests of Pennsylvania that many localities have been visited by tornadoes of which no accounts have ever been recorded. The places referred to are called 'windfalls'; the timber having been prostrated apparently by violent storms of wind, while the trees immediately adjoining remain erect and undisturbed. Sometimes, instead of forming a path through the forest, the tornado has descended, and quickly ascended into the air, leaving its marks on a small area. Judging by the remains of the timber-trees thrown down, these events were of all ages, and of various degrees of violence. Sometimes the fallen timber was found sufficiently sound, after the first settlement of the country, to be worth manufacturing into lumber; in other cases, being older or more shattered, it was worthless; while in others it has entirely decayed and disappeared, the ground being covered with a later growth of a smaller and different kind, and the sur-

face dotted with hillocks, like rifle-pits, caused by the up-turned roots of large trees, of which no other vestige remains. In the eastern part of Bradford county were extensive ancient windfalls, still recollected by the older inhabitants, where now is a fine, well-cultivated farming-country; and in the southwestern part of the same county a tornado of a later date left a long, straight path through the pine timber, which was known as the 'Devil's Lane.' I have seen the track of an extensive tornado in the forest of one of the Alleghany Mountain counties of this state. I have reports of others in West Virginia and in Indiana, and of very numerous ones in the vast forests of Lower Canada, in New Brunswick, and Nova Scotia. Every hunter and lumberman who has travelled through the forests is familiar with these evidences of more or less ancient tornadoes, and of a few in later times. From their occurring in uninhabited regions, and from their not being attended with loss of life or improvements, no accounts of them are to be found, and the traditions of them are soon forgotten. In the further study of this interesting subject, these fossilized tornadoes, so to speak, should not be overlooked. The tornadoes of Kansas, Missouri, Illinois, Minnesota, and Georgia, are probably only repetitions of what has at long intervals occurred fortuitously in all parts of our country.

JAMES MACFARLANE.

Towanda, Penn., March 11.

[Windfalls are the subject of Tornado circular No. 12, which may be obtained on application to the chief signal-officer, U. S. Army, Washington. Information concerning the location, direction, length and width, and, if possible, also the date, of these old tornado-tracks, is much desired.]

Remains of a prehistoric tree.

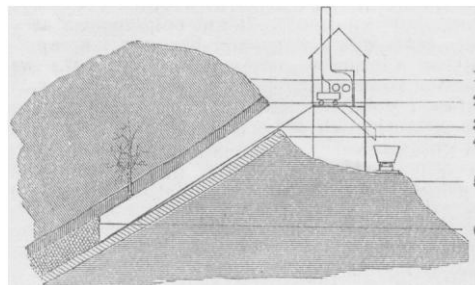
While making some assays for the Oregon iron and steel company, during the past summer, I was often in the mines of the company at Oswego, eight miles south from Portland, Ore.

Being on one occasion about five hundred feet down the main gangway, my attention was called to a curious 'hole in the roof.' On examination, I found it to be a perpendicular cylindrical cavity in the roof-rock, in diameter about ten inches. Upon feeling the walls of the cavity, I found the surface somewhat rough, like the bark of a tree. Introducing a lamp, I could discern small indentations corresponding to the knots and twigs upon the trunks of trees. I was convinced that the hole had once been occupied by a tree, and, procuring a jointed pole, probed the cavity to a height of twenty-two feet. Toward the top the indentations became more numerous; and, by replacing the stiff pole by a flexible bamboo, the side orifices could be probed to a depth of two or three feet, and seemed to have a slight inclination (see figure).

Examining the ore on roof and sides, I was rewarded by finding a network of roots, which retained their original forms perfectly, although petrified. I procured one specimen an inch and a half in diameter. An analysis of it showed the material occupying the position of the original bark to be kaoline; it being perfectly white, and about a quarter of an inch in thickness. Inside this ring of kaoline the wood had been replaced by iron ore, not differing from that of the surrounding vein.

Above and below the ore I found no roots; the tree having grown in the space now occupied by the ore-vein, and at an inclination to it. The strata dip to the north at an angle of 35° to the horizon.

Immediately under the ore is a stratum of scoriae one to three feet in thickness. Below this is hard, compact basalt. The roof of the mine is 'greenstone,' decomposed by heat to coarse sand-rock immediately over the ore. The ore-vein averages five feet and a half in thickness.



SECTION IN MINE AT OSWEGO, ORE.

1, 'greenstone'; 2, sand-rock; 3, gangway; 4, scoriae; 5, basalt; 6, ore-vein.

At six hundred feet I found pieces of wood not petrified, and in a good state of preservation, some parts showing a charred surface. I found afterwards, in other parts of the mine, several smaller orifices in the roof-rock, and similar to that described above.

HAROLD B. NYE.

Congenital deafness in animals.

Mr. Lawson Tait, quoted by Professor Bell in *Science*, No. 54, says that 'congenital deafness is not known to occur in any animal but the cat.' In contradiction to this statement, Dr. Burnett has reported to you (No. 57) the cases of two deaf dogs; and I now refer you to the mention of a deaf-mute cow in Dr. Haubner's 'Bericht über veterinärwesen,' quoted in the 'Organ der taubstummen-und blinden-anstalten in Deutschland,' vol. xxv. p. 176. This cow was twelve years old, and had been in the possession of the same owner since she was three weeks old. She was perfectly deaf to all sounds. At feeding-time, or when a calf was taken away from her, she made the same demonstrations that other cows do, stretching out her head and neck, and opening her mouth wide as if to bellow, but only making a short, deep, gurgling sound, very different from the ordinary lowing of cattle. Her sight was good, and she was an intelligent animal. Nothing abnormal could be discovered in her ears or throat. Her color is not mentioned. She had had eight calves: but whether these inherited their parent's deafness is not known; for in this case the danger, if such a danger existed, of 'the formation of a deaf variety' of the bovine race was effectually prevented by the early butchering of the calves.

EDWARD ALLEN FAY.

National deaf-mute college, Washington, D.C.,
March 14.

Muraenopsis.

Is it not by mistake that you state, in the review of 'Yarrow's check-list' (*Science*, No. 56, p. 264), that the generic name 'Muraenopsis' must be suppressed because 'pre-occupied among the eels'? The name was first applied to eels by Kaup (1856, 'Catalogue of apodal fish,' p. 11), though credited by him to Le Sueur. The latter, however, did not use it. His name was 'Muraenophis' (1825, *Journ. Philad. acad.*, v. p. 107), or 'Muraenaphis' (l.c., pl. iv.), or 'Muraenophis' (l.c., index). Kaup's error was copied by